

Supercomputing at NASA

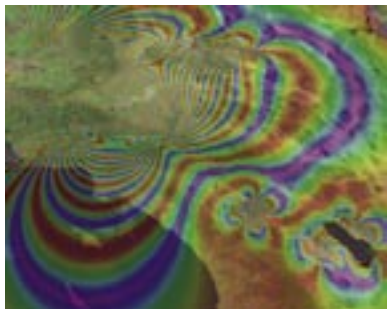
Supercomputers recreate the universe mathematically at billions of calculations per second. These machines are enabling NASA to:

Assimilate vast quantities of observation data into models.



Aqua satellite
NASA

Simulate Earth and space phenomena that cannot be observed directly.



Simulation
of surface
deformation
from interacting
earthquake faults
in southern
California
NASA/JPL

Understand how the Earth system evolves over time.

Identify consequences of change for regional assessments, economic, and policy decisions.

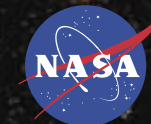
Produce predictions of weather, climate, natural hazards, and other phenomena.

For More Information

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<http://ct.gsfc.nasa.gov>

Partnering with NASA's
Earth Science Technology Office



National Aeronautics and
Space Administration
Goddard Space Flight Center

Computational Technologies Project

Exploring Earth and space
with supercomputers

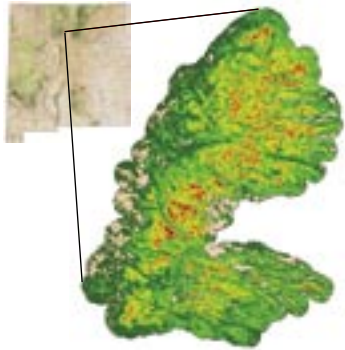
Cloud cover
simulation
NASA/GSFC



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What CT Does

Serving NASA's Earth Science Enterprise, the Computational Technologies (CT) Project builds scientific and engineering collaborations to develop software frameworks that enable realistic simulations of natural phenomena and interpretation of vast quantities of observational data using supercomputers.



Predicted number of exotic plants at Cerro Grande Wildfire Site, Los Alamos, New Mexico
USGS-NASA

CT Activities

Selects world-class investigation teams to develop supercomputing applications software technology in the Earth and space sciences.

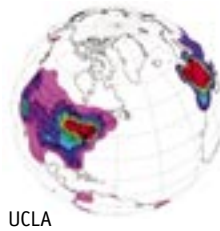
Supports NASA-based computational scientists who develop software to simplify parallel programming and visualize data.

Designs software to be usable by the wider research community.

Provides easy access to public domain software on the World Wide Web.

Arranges supercomputer access for NASA-sponsored scientists and engineers to apply their expertise to solving major problems.

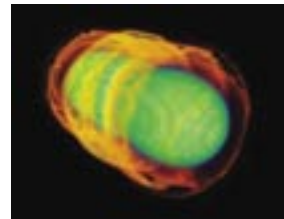
CT Scientific Firsts



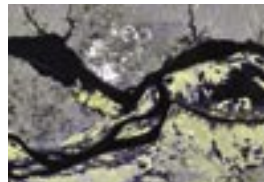
UCLA

Coupled models yield comprehensive picture of chlorofluorocarbons in atmosphere.

Neutron stars merge to form black hole in general relativity simulation.



Washington Univ.



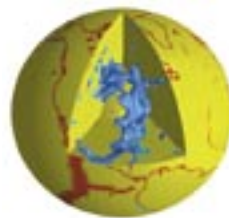
NASA/JPL

Amazon rainforest mosaic correlates flooding and deforestation.

Simulation demonstrates plausible mechanism for coronal mass ejection to escape Sun.



NRL-NASA/GSFC



Princeton Univ.

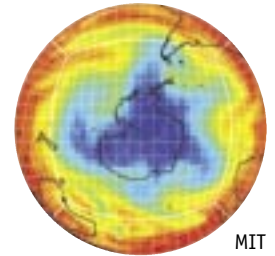
Combining seismic data with simulations locates remnants of tectonic plate that formed Rocky Mountains.

Software Frameworks

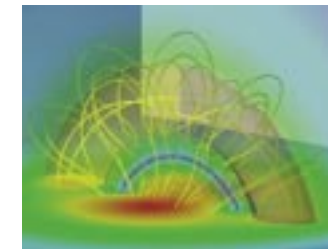
A framework is a software infrastructure that allows multiple organizations to share and reuse each other's software.

CT Frameworks Underway

- Earth system modeling (climate and weather)
- Earthquake forecasting
- Invasive plant species prediction



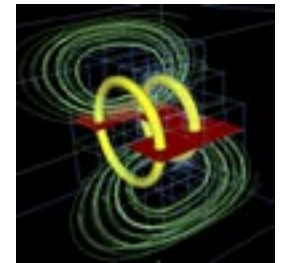
MIT



Univ. of Michigan

- Space weather modeling
- Gamma-ray burst and radiation flow modeling

- Star formation and microgravity environments simulation
- National Virtual Observatory mosaicking service



Lawrence Berkeley Natl. Lab

Benefits of Frameworks

- Reduce redundant effort
- Strengthen communication and collaboration among diverse groups
- Simplify exchange and incorporation of new sub-models
- Accelerate improvements in U.S. modeling and predictive capabilities